What is claimed is:

1. A process for impregnating a continuous fiber material, comprising the steps of:

(a) providing a continuous feed of a continuous fiber material having a tension of at least about 0.25 pound;

(b) heating the fiber material to a first temperature of at least about 392°F (200°C);

(c) contacting said reinforcing material when heated with a molten resin composition at a second temperature that is less than the first temperature;

wherein a shear force is applied to the reinforcing material at a time when the reinforcing material is in contact with the molten resin composition, to form an impregnated fiber material having substantially no voids.

2. A process for impregnating a continuous fiber material, comprising the steps of:

(a) providing a continuous feed of a continuous fiber material having a tension of at least about 0.25 pound;

(b) heating the fiber material to a first temperature of at least about 392°F (200°C);

(c) pulling the heated reinforcing material though a bath of molten resin composition and over at least one shear pin in the bath, wherein the temperature of the molten resin composition is lower than the first temperature, and further wherein the dwell time of the reinforcing material in the bath is less than about 10 seconds;

wherein an impregnated fiber material having substantially no voids is formed.

3. A process according to either claim 1 or claim 2, wherein the first temperature is at least about 428°F (220°C).

4. A process according to either claim 1 or claim 2, wherein the first temperature is at least about 446°F (230°C).

5. A process according to either claim 1 or claim 2, wherein the first temperature is at least about 473°F (245°C).

6. A process according to either claim 1 or claim 2, wherein the first temperature is at least about 500°F (260°C).

7. A process according to either claim 1 or claim 2, wherein the first temperature is at least about 536°F (280°C).

8. A process according to any of claims 1-7, wherein the temperature of the molten resin composition is at least about 75°F (42°C) lower than the first temperature.

9. A process according to any of claims 1-7, wherein the temperature of the molten resin composition is at least about 100°F (56°C) lower than the first temperature.

10. A process according to any of claims 1-7, wherein the temperature of the molten resin composition is at least about 150°F (83°C) lower than the first temperature.

11. A process according to any of claims 1-7, wherein the temperature of the molten resin composition is at least about 200°F (111°C) lower than the first temperature.

12. A process according to any of claims 1-11, wherein the temperature of the molten resin composition is up to about 500°F (278°C) above the first temperature.

13. A process according to any of claims 1-12, wherein the fiber material is contacting the molten resin composition for no more than about 5 seconds before cooling of the molten resin composition begins.

14. A process according to any of claims 1-12, wherein the fiber material is contacting the molten resin composition for no more than about 2 seconds before cooling of the molten resin composition begins.

15. A process according to any of claims 1-12, wherein the fiber material is contacting the molten resin composition for no more than about 1 second before cooling of the molten resin composition begins.

16. A process according to any of claims 1-15, wherein the fiber material is impregnated at a rate of at least about 10 feet (305 cm) per minute.

17. A process according to any of claims 1-15, wherein the fiber material is impregnated at a rate of at least about 20 feet (610 cm) per minute.

18. A process according to any of claims 1-15, wherein the fiber material is impregnated at a rate of at least about 30 feet (914 cm) per minute.

19. A process according to any of claims 1-15, wherein the fiber material is impregnated at a rate of about at least 40 feet (1220 cm) per minute.

20. A process according to any of claims 1-19, wherein the viscosity of the molten resin composition is at least about 125 Pascals.

21. A process according to any of claims 1-19, wherein the viscosity of the molten resin composition is at least about 150 Pascals.

22. A process according to any of claims 1-19, wherein the viscosity of the molten resin composition is at least about 200 Pascals.

23. A process according to any of claims 1-19, wherein the viscosity of the molten resin composition is from about 125 to about250 Pascals.

24. A process according to claim 2, wherein the bath is pressurized.

25. A process according to claim 24, wherein the pressure of the bath is at least about 10 psi.

26. A process according to any of claims 1-25, wherein the reinforcing material is a filament bundle.

27. A process according to any of claims 1-26, wherein the reinforcing material comprises a material selected from the group consisting of glass fibers, carbon fibers, graphite fibers, polymeric fibers, aramide fibers, and mixtures thereof.

28. A process according to any of claims 1-27, wherein the reinforcing material comprises a high silica glass fiber.

29. A process according to any of claims 1-28, wherein the reinforcing material is coated with a sizing or finishing material.

30. A process according to any of claims 1-29, wherein the reinforcing material comprises a high silica glass fiber coated with a sizing.

31. A process according to any of claims 1-30, wherein the resin composition comprises at least one resin selected from the group consisting of ABS, acrylics, acrylonitriles, epoxies, polyarylether ketones, polyether etherketones, amino resins, phenolic resins, polyamides, polyimides, polyolefins, polycarbonates, polyesters, polyetherimides, polyarylene sulfides, polyvinyl resins, polyurethanes, polysulfones, and copolymers and mixtures thereof.

32. A process according to any of claims 1-31, wherein the resin composition is a thermoplastic composition.

33. A process according to any of claims 1-31, wherein the resin composition comprises at least one thermosetting resin selected from the group consisting of epoxies, polyesters, and phenolic resins.

34. A process according to any of claims 1-33, including the further step of drawing the prepreg material through a sizing die.

35. A process according to claim 2, wherein there are from 1 to about 4 shear pins.

36. A process according to claim 35, wherein said shear pins are heated to a temperature above the temperature of the molten resin composition.

37. A process according to claim 1, wherein the shear force is applied to the reinforcing material by drawing the heated reinforcing material over at least one shear pin and further wherein said shear pin has an opening for providing the molten resin composition to the reinforcing material.

38. A process according to any of claims 1-37, including a further step of providing a cladding layer to the impregnated fiber material.

39. A process according to clam 38, wherein the cladding layer is provided by pulling the hot impregnated fiber material through a chopped or pulverulent material.

40. A process according to claim 39, wherein the chopped or pulverulent material is a reinforcing material.

41. A process according to claim 39, wherein the pulverulent material is a carbon black.

42. A process according to ~~claim 38~~, wherein the impregnated fiber material is coated with a polymer composition.

43. A process according to any of claims 1-37, including a further step of cutting the impregnated fiber material into lengths of from about 3 mm to about 76 mm.

44. A process according to any of claims 1-37, wherein the impregnated fiber material is a flattened fiber bundle.

45. A process according to claim 44, including a further step of weaving the flattened fiber bundle into a mat or cloth.

46. A process according to any of claims 1-45, wherein the resin composition includes a resin capable of forming crystalline regions upon cooling.

47. A process according to claim 46, wherein the resin composition includes an acid-modified or anhydride-modified polypropylene or polyethylene.

48. A process according to claim 47, wherein the fiber material is glass.

49. A process according to any of claim 1-48, comprising a further step of forming the prepreg into a desired shape.

50. A process according to claim 35, wherein the prepreg is formed by a method selected from the group consisting of lay-up, compression molding, injection molding, thermoforming, blow molding, calendering, extrusion, casting, laminating, filament

winding, rotational molding, transfer ~~molding~~, stamping, and weaving operations, and combinations ~~thereof~~.

Sub A2

51. An article formed by the process of any of claims 1-50.

Sub C1

52. A prepreg material formed by a step of impregnating a fibrous reinforcement at a first temperature with a molten resin composition, wherein the temperature of the molten resin composition is at least about 75°F (42°C) lower than the first temperature, and further wherein said prepreg material has substantially no voids.

53. A prepreg material according to claim 52, comprising from about 25 to about 75% by weight resin.

54. A prepreg material according to claim 52, comprising a thermoplastic composition.

55. A prepreg material according to claim 52, comprising a thermoset composition.

Sub B2

56. A prepreg material according to claim 52, comprising a material selected from the group consisting of glass fibers, carbon fibers, graphite fibers, polymeric fibers, aramide fibers, and mixtures thereof.

57. A prepreg material according to claim 52, wherein the reinforcing material comprises a high silica glass fiber.

58. A prepreg material according to claim 52, wherein the reinforcing material is coated with a sizing or finishing material.

Sub C1

59. A fiber-reinforced article prepared according to the process of claim 22.

60. A fiber-reinforced article prepared according to the process of claim 23.

61. A fiber-reinforced article prepared according to the process of claim 24.

Sub B3

62. An apparatus for impregnating a continuous fiber material, comprising a heater for heating a fibrous reinforcing material to a first temperature, a means for applying a

tension to the fibrous reinforcing material, and a container having an inlet and an outlet for the heated fibrous reinforcing material in which the heated reinforcing material is contacted with a molten resin composition; wherein container includes therein a shearing mechanism for the fibrous reinforcing material.

Sub C1

63. An apparatus according to claim 62 wherein the shearing mechanism comprises at least one shear pin.

64. An apparatus according to claim 62, wherein the shearing mechanism comprises at from one to about four shear pins.

65. An apparatus according to claim 62, wherein the shearing mechanism comprises a pair of shear pins.

66. An apparatus according to one of claims 63-65, wherein at least one shear pin has an opening to provide the molten resin composition.

67. An apparatus according to any of claims 63-66, wherein at least one shear pin is connected to a heat source for heating the shear pin.

68. An apparatus according to any of claims 62-67, wherein said container further comprises a unit for applying pressure to the resin composition.

69. An apparatus according to any of claims 62-68, wherein said outlet is a sizing die.

70. An apparatus according to any of claims 62-69, further including molding equipment for forming the reinforced matrix resin composition into an article of a desired shape.

71. An apparatus according to any of claims 62-70, wherein the heater is selected from the group consisting of radiant heaters, inductive heaters, infrared tunnels, ovens, and combinations thereof.

Sub B5

72. An apparatus for preparing a reinforced matrix resin composition, comprising a heater for heating a fibrous reinforcing material to a first temperature and a compressing

unit for pressing the heated fibrous reinforcing material together with a resin composition; wherein the first temperature, as measured at the point where the heated fibrous reinforcing material is first brought into contact with the resin composition, is above the melting point, softening point, or T_g of the resin composition.

Sub C1

73. An apparatus according to claim 72, wherein the compressing unit is at least one pair of compaction rollers.

Sub B6

74. An apparatus according to claim 72, wherein said temperature is up to about 500°F above the melting point, softening point, or T_g of the resin composition.

Sub C1

75. An apparatus according to claim 72, further comprising a sizing die located after said compressing unit.

76. An apparatus according to claim 72, further including molding equipment for forming the reinforced matrix resin composition into an article of a desired shape.

77. An apparatus according to claim 72, wherein the heater is selected from the group consisting of radiant heaters, inductive heaters, infrared tunnels, ovens, and combinations thereof.

Sub B7

78. An apparatus for preparing a reinforced matrix resin composition, comprising a heater for heating a fibrous reinforcing material to a first temperature and a compressing unit for pressing the heated fibrous reinforcing material together with a crystallizable resin composition; wherein the first temperature, as measured at the point where the heated fibrous reinforcing material is first brought into contact with the resin composition, is sufficiently high to cause crystallization at the interface of said reinforcing material and said resin composition.

Sub C1

79. An apparatus according to claim 78, wherein said resin composition has a viscosity greater than 200 pascals.

80. An apparatus according to claim 78 wherein said crystalization is enhanced by the presence of a maleic anhydride group.